

AD/A-006 016

ATLAS OF GOAT ANATOMY. PART IV.
INTERNAL ORGANS

Clarence E. Hopkins, Sr.

Edgewood Arsenal
Aberdeen Proving Ground, Maryland

February 1975

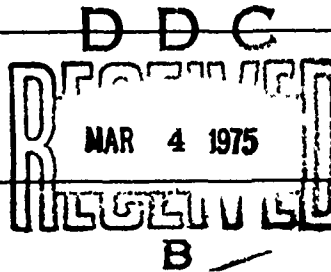
DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER EB-TR-74077	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER AD/A-006016
4. TITLE (and Subtitle) ATLAS OF GOAT ANATOMY PART IV: INTERNAL ORGANS		5. TYPE OF REPORT & PERIOD COVERED Technical Report July 1973-July 1974
7. AUTHOR(s) Clarence E. Hopkins, Sr.		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Commander, Edgewood Arsenal Attn: SAREA-BL-BS Aberdeen Proving Ground, Maryland 21010		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS Commander, Edgewood Arsenal Attn: SAREA-TS-R Aberdeen Proving Ground, Maryland 21010		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Task IT061101A91A15
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE February 1975
		13. NUMBER OF PAGES 38
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE NA
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES In-house laboratory independent research		
Reproduced by NATIONAL TECHNICAL INFORMATION SERVICE US Department of Commerce Springfield, VA. 22151		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
Internal organs	Dissecting	
Goat atlas	Drawings	
Photographs	Labeling	
PRICES SUBJECT TO CHANGE		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
<p>The Angora goat (<i>Capra hircus</i>) has been the main experimental animal used by the Biophysics Division of the Biomedical Laboratory for many years. Knowledge of goat anatomy is important during both the planning and experimental stages of projects. Because no readily usable information on goat anatomy is available, a series of reports on the subject is being prepared. The first in the series described the skeletal anatomy; the second described the cross-section anatomy; the third described the muscles on superficial and deep dissection of the head, neck, and pectoral and pelvic limbs. This report concerns the internal organs and describes the structures of each organ.</p>		

PREFACE

The work described in this report was authorized under Task 1T061101A91A15, In-House Laboratory Independent Research; Atlas of the Goat. This work was started in July 1973 and completed in July 1974.

In conducting the research described in this report, the investigator adhered to the "Guide for the Care and Use of Laboratory Animals," as promulgated by the Committee on the Revision of the Guide for Laboratory Animal Facilities and Care of the Institute of Laboratory Animal Resources—National Research Council.

Reproduction of this document in whole or in part is prohibited except with permission of the Commander, Edgewood Arsenal, Attn: SAREA-TS-R, Aberdeen Proving Ground, Maryland 21010; however, DDC and the National Technical Information Service are authorized to reproduce the document for US Government purposes.

Acknowledgments

The author wishes to acknowledge the technical assistance of John J. Holter, Joseph B. Scott, and Garnet E. Affleck, Jr., Biophysics Division, who prepared the photographs.

CONTENTS

	Page
I. INTRODUCTION	5
II. MATERIALS AND METHODS	5
III. INTERNAL ORGANS	6
LITERATURE CITED	37
DISTRIBUTION LIST	38

LIST OF FIGURES

Figure

1 Deep Dissection of Right Side of Goat with Diaphragm Removed (Ribs Retained for Landmarks)	6
2 Deep Dissection of Left Side of Goat with Diaphragm <i>in Situ</i>	7
3 Deep Dissection of Left Side of Goat with Diaphragm and Fourth Rib Removed	8
4 Deep Dissection of Left Side of Goat with Left Lung and Left Diaphragm Removed (Fourth Through Ninth Ribs Removed)	9
5 Ventral View of Abdominal Viscera of Goat with Omentum Removed	10
6 Ventral View of Lungs of Goat with Sternum Removed	11
7 Ventral View of Lungs of Goat with Sternum Removed	12
8 Right View of Goat Brain	13
9 Right View of Goat Brain	14
10 Base of Goat Brain	15
11 Base of Goat Brain	16
12 Median Section of Goat Brain	17
13 Median Section of Goat Brain	18
14 Dorsal View of Goat Brain	19
15 Dorsal View of Goat Brain	20
16 Costal Surface of Right Lung of Goat	21
17 Costal Surface of Right Lung of Goat	22

CONTENTS (Contd)

Figure		Page
18	Costal Surface of Left Lung of Goat	23
19	Costal Surface of Left Lung of Goat	24
20	Left and Right View of Goat Lung	25
21	Right and Left View of Goat Heart	26
22	Right and Left View of Goat Heart	27
23	Parietal and Visceral View of Goat Liver	28
24	Parietal and Visceral View of Goat Liver	29
25	Left and Right View (Cut Surface) of Goat Adrenal	30
26	Lateral and Cut Surface of Goat Spleen	31
27	Visceral and Parietal View of Goat Pancreas	32
28	Right Lateral View of Goat Stomach	33
29	Digestive System in the Domestic Goat	34
30	Dorsal View of Goat Tongue, Pharynx, Larynx, Etc.	35
31	Right Kidney of Goat	36

ATLAS OF GOAT ANATOMY

PART IV: INTERNAL ORGANS

I. INTRODUCTION.

The Angora goat (*Capra hircus*) has been the main experimental animal used by the Biophysics Division of the Biomedical Laboratory for many years. Knowledge of goat anatomy is important during both the planning and experimental stages of projects. Because no readily usable information on goat anatomy is available, a series of reports on the subject is being prepared. The first in the series¹ described the skeletal anatomy; the second² described the cross-sectional anatomy; and the third³ described the muscles on superficial and deep dissection of the head, neck, and pectoral and pelvic limbs.

This report concerns the internal organs and describes the structures of each organ.

II. MATERIALS AND METHODS.

Eight castrated Angora goats were used. Each goat was euthanized with phenobarbital sodium. The goats were of average size, weighing 40 to 50 kg. Deep dissection was done on four goats showing the right and left lateral side with the internal organs intact (figures 1 through 4). Another goat was dissected to show the ventral view of the abdominal viscera (figure 5) and the ventral view of the lungs (figures 6 and 7). Three goats were dissected to obtain the internal organs. The organs were either drawn or photographed and labeled accordingly. The drawings are placed with some of the photographs with a centimeter scale showing the exact size of the organ.

A total of 14 drawings and 28 photographs was made while the dissection of the organs was taking place. The organs dissected were the brain, tongue, lungs, heart, liver, kidneys, adrenal, spleen, pancreas, and the stomach (figures 1 through 31).

The drawing of the digestive system in the domestic goat shows the passageway through the system of the four stomachs (abomasum, reticulum, omasum, and rumen) (figure 29).

The anatomy books of Sisson and Grossman⁴ and Max⁵ and the excellent book by Miller et al.⁶ were used as references during the preparation of this atlas.

III. INTERNAL ORGANS.



Figure 1. Deep Dissection of Right Side of Goat with Diaphragm Removed (Ribs Retained for Landmarks)

1, First rib; 2, apical lobe of right lung; 3, cardiac lobe of right lung; 4, diaphragmatic lobe of right lung; 5, reticulum; 6, ventral lobe of liver; 7, dorsal lobe of liver; 8, right kidney; 9, gallbladder; 10, omasum; 11, rumen; 12, abomasum; D, diaphragm; L, right lung; P, pericardium; S, sternum; Si, small intestine; X, xiphoid cartilage.

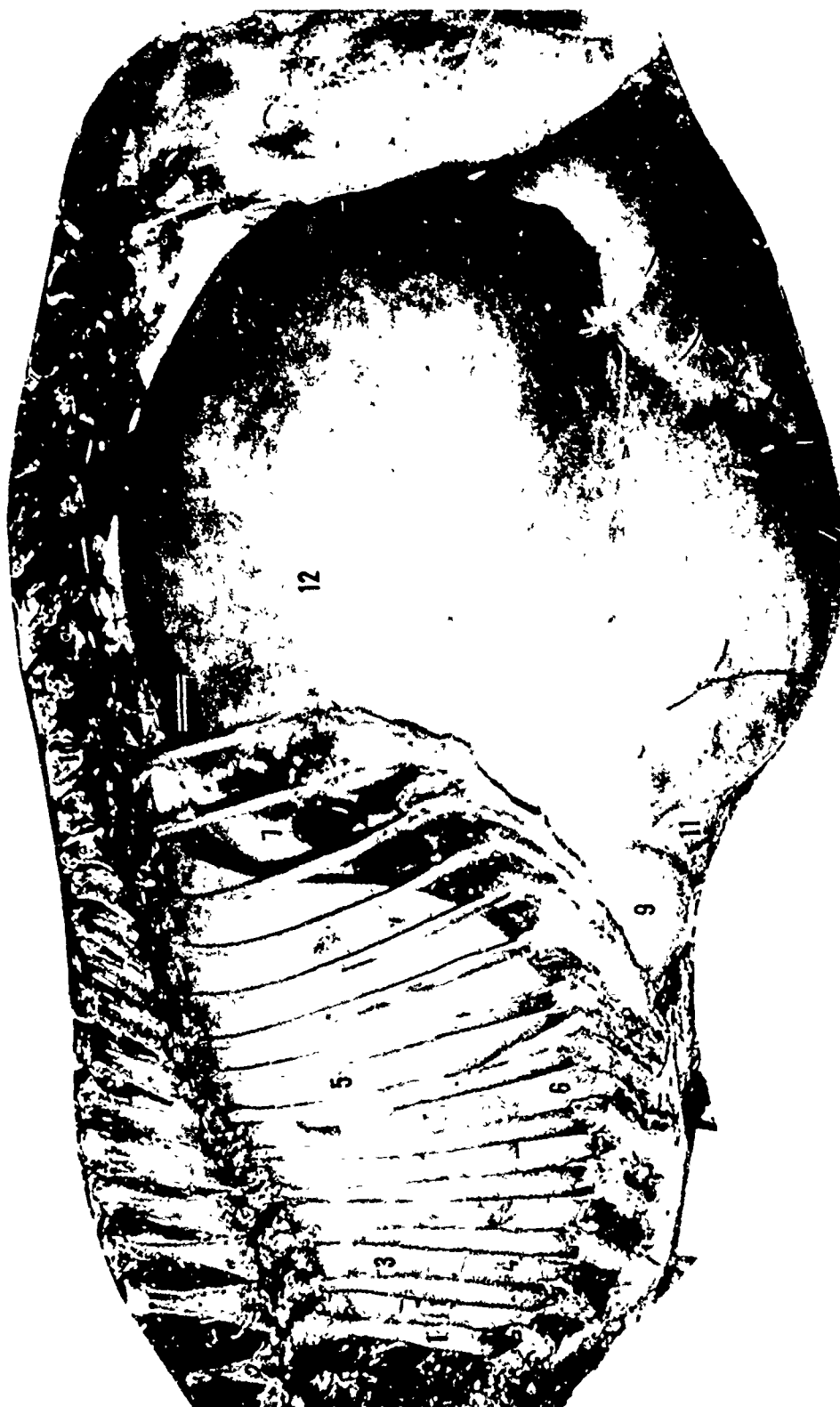


Figure 2. Deep Dissection of Left Side of Goat with Diaphragm *in Situ*

1, First rib; 2, first thoracic vertebra; 3, apical lobe of left lung; 4, apical lobe of right lung; 5, diaphragmatic lobe of left lung; 6, cardiac lobe of left lung; 7, diaphragm; 8, portion of spleen; 9, reticulum; 10, first lumbar vertebra; 11, omasum; 12, dorsal sac of rumen.

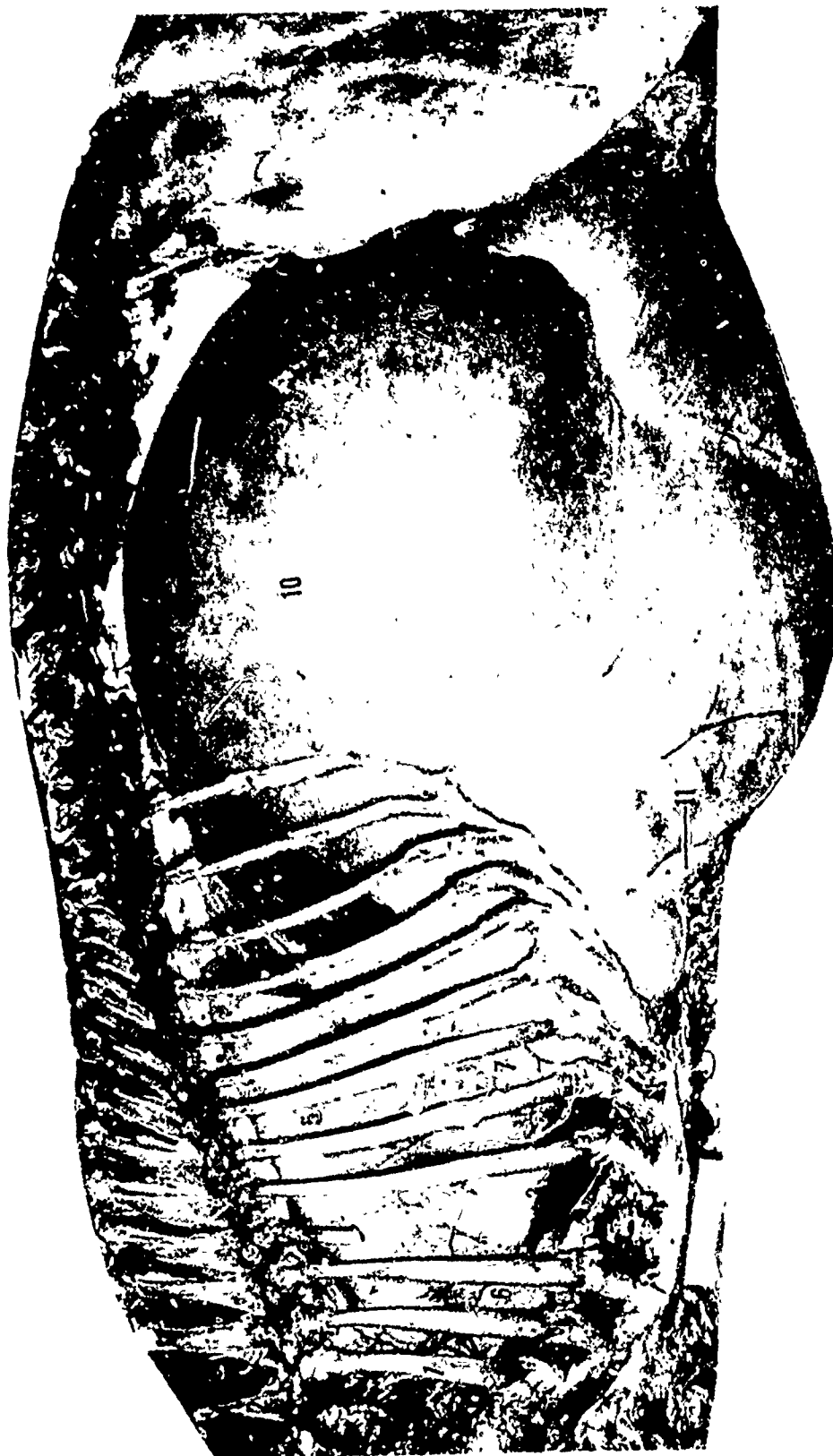


Figure 3. Deep Dissection of Left Side of Goat with Diaphragm and Fourth Rib Removed
 1, First rib; 2, first thoracic vertebra; 3, heart; 4, fourth rib (cut); 5, left lung; 6, apical lobe of right lung; 7, reticulum; 8, spleen; 9, first lumbar vertebra; 10, dorsal sac of rumen; 11, omasum.



Figure 4. Deep Dissection of Left Side of Goat with Left Lung and Left Diaphragm Removed
(Fourth Through Ninth Ribs Removed)

1. First rib; 2, first thoracic vertebra; 3, thymus; 4, apical lobe of right lung; 5, heart; 6, aorta;
7, esophagus; 8, reticulum; 9, spleen; 10, first lumbar vertebra; 11, omasum; 12, dorsal sac of rumen;
A, bronchus.



Figure 5. Ventral View of Abdominal Viscera of Goat with Omentum Removed

1, Reticulum; 2, abomasum; 3, rumen; 4, omasum; 5, 7, and 8, colon; 6, small intestine; C, caecum; D, diaphragm; L, liver; S, sternum; V, ventral sac of rumen.

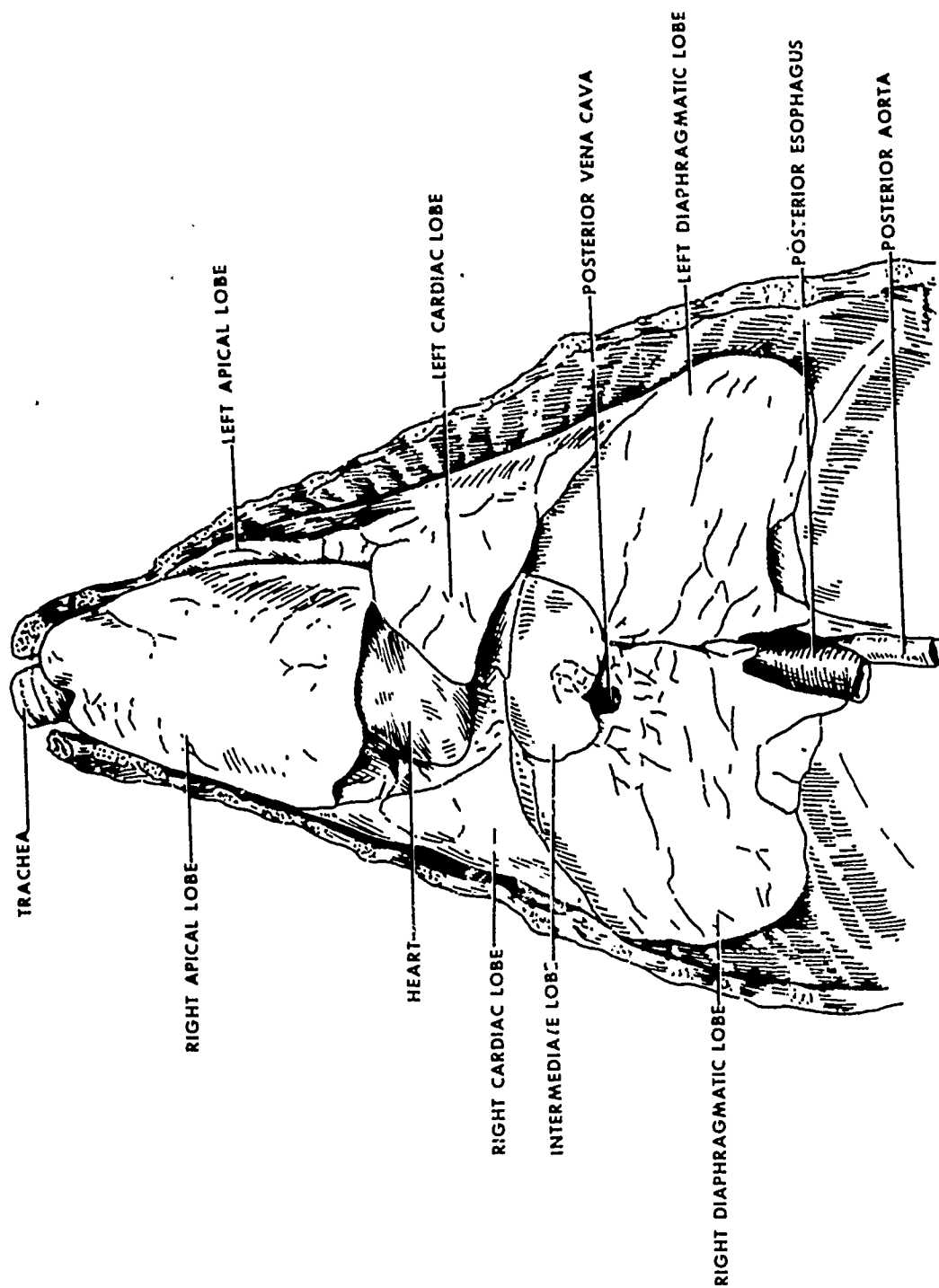


Figure 6. Ventral View of Lungs of Goat with Sternum Removed



Figure 7. Ventral View of Lungs of Goat with Sternum Removed

1, Trachea; 2, right apical lobe; 3, heart; 4, right cardiac lobe; 5, left cardiac lobe; 6, left diaphragmatic lobe; 7, right diaphragmatic lobe; 8, posterior esophagus; 9, aorta.

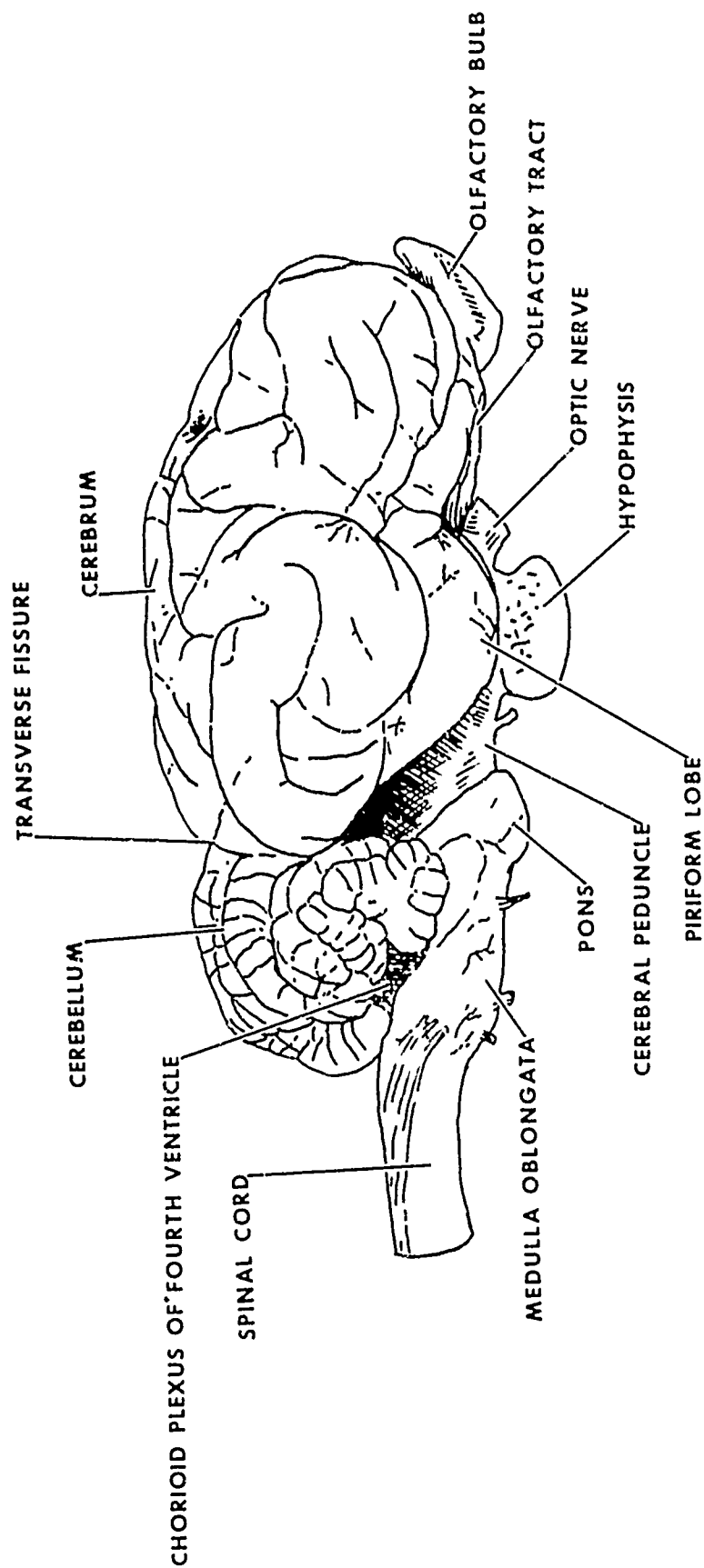


Figure 8. Right View of Goat Brain

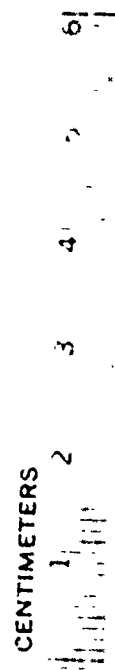


Figure 9. Right View of Goat Brain

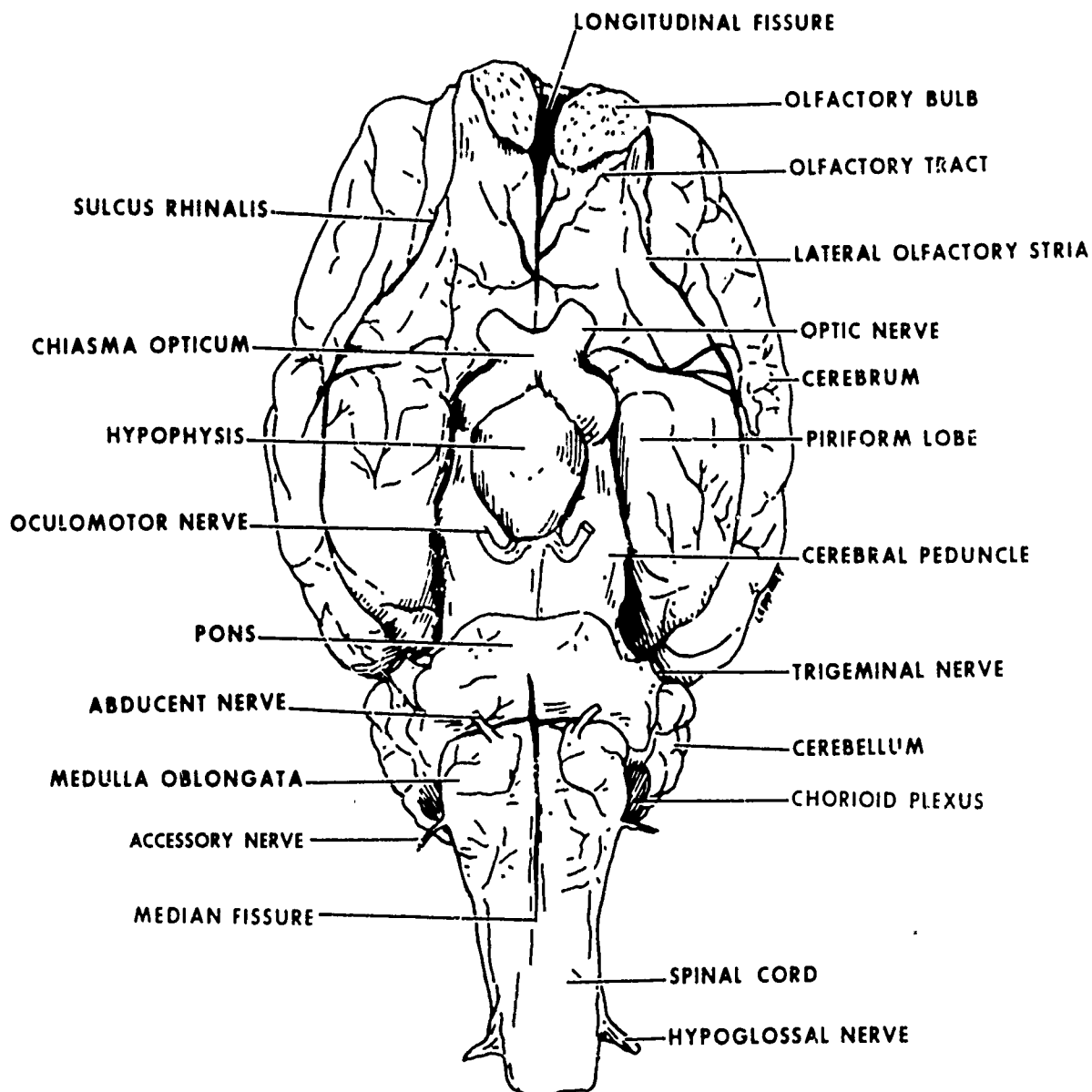


Figure 10. Base of Goat Brain



CENTIMETERS



Figure 11. Base of Goat Brain

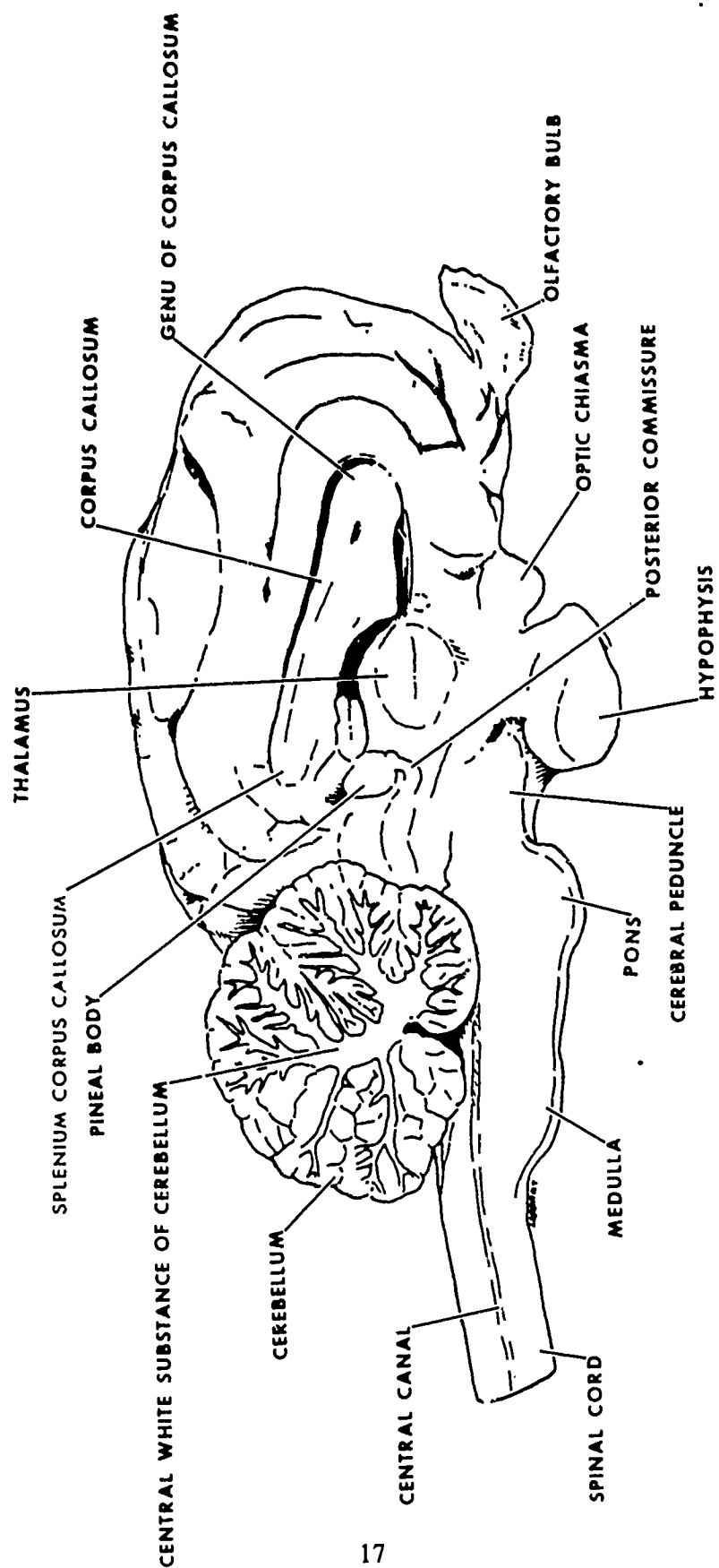


Figure 12. Median Section of Goat Brain



CENTIMETERS

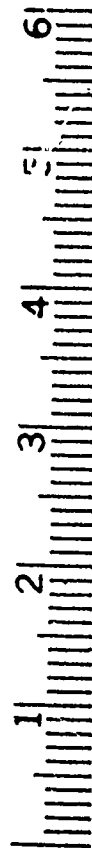


Figure 13. Median Section of Goat Brain

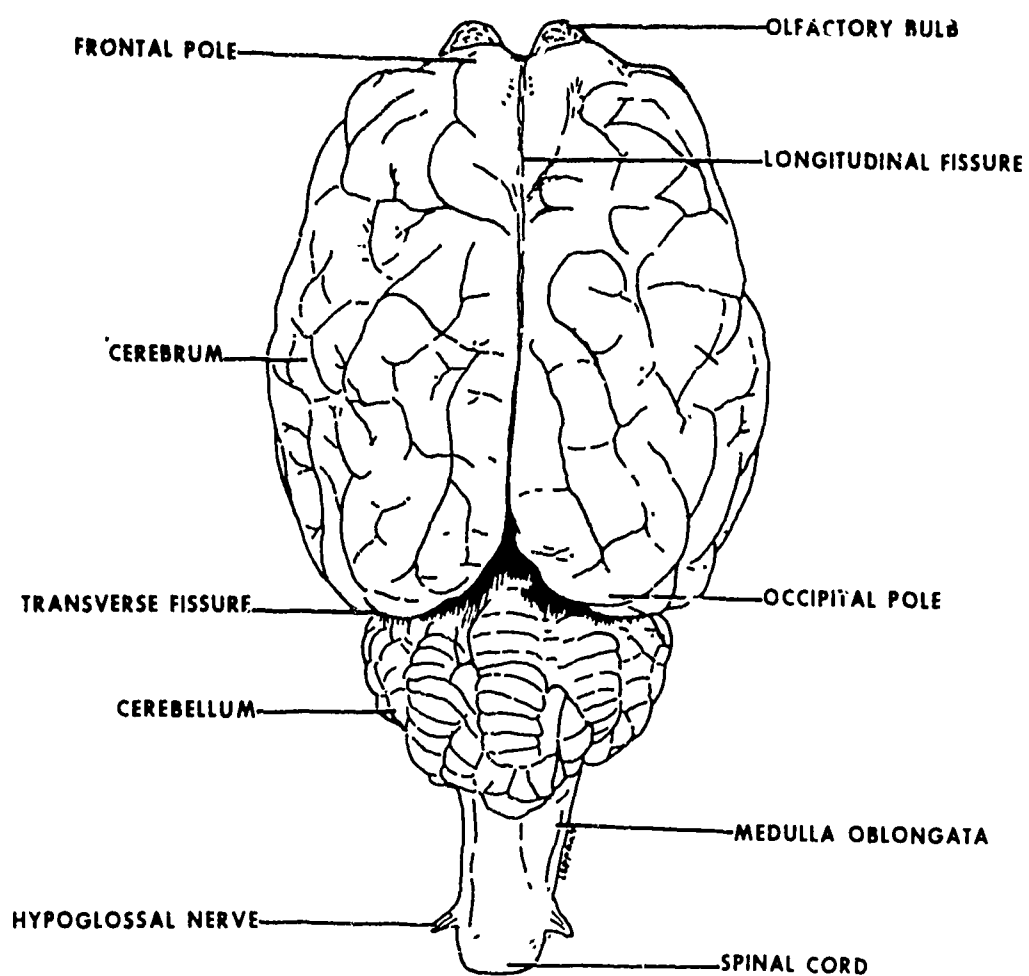


Figure 14. Dorsal View of Goat Brain

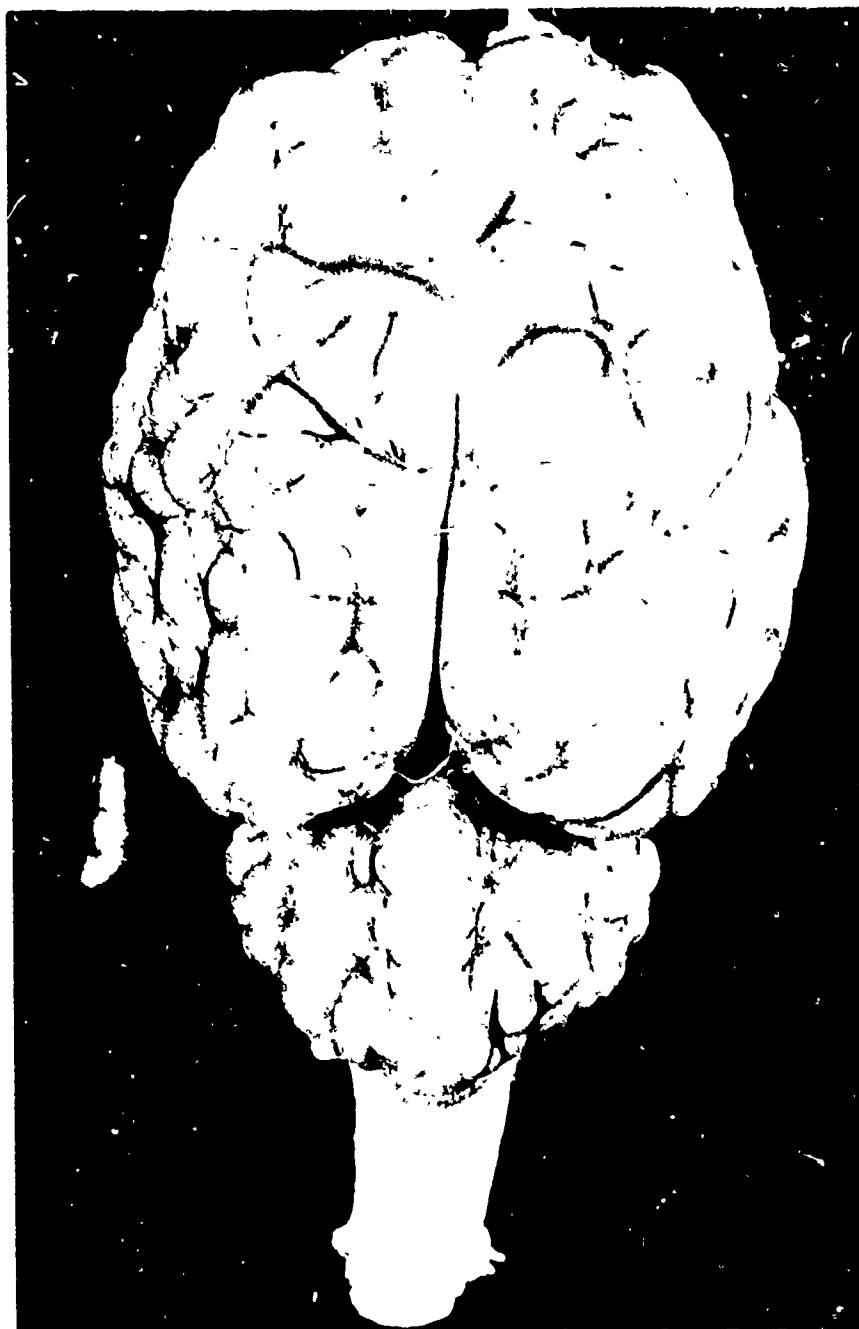


Figure 15. Dorsal View of Goat Brain

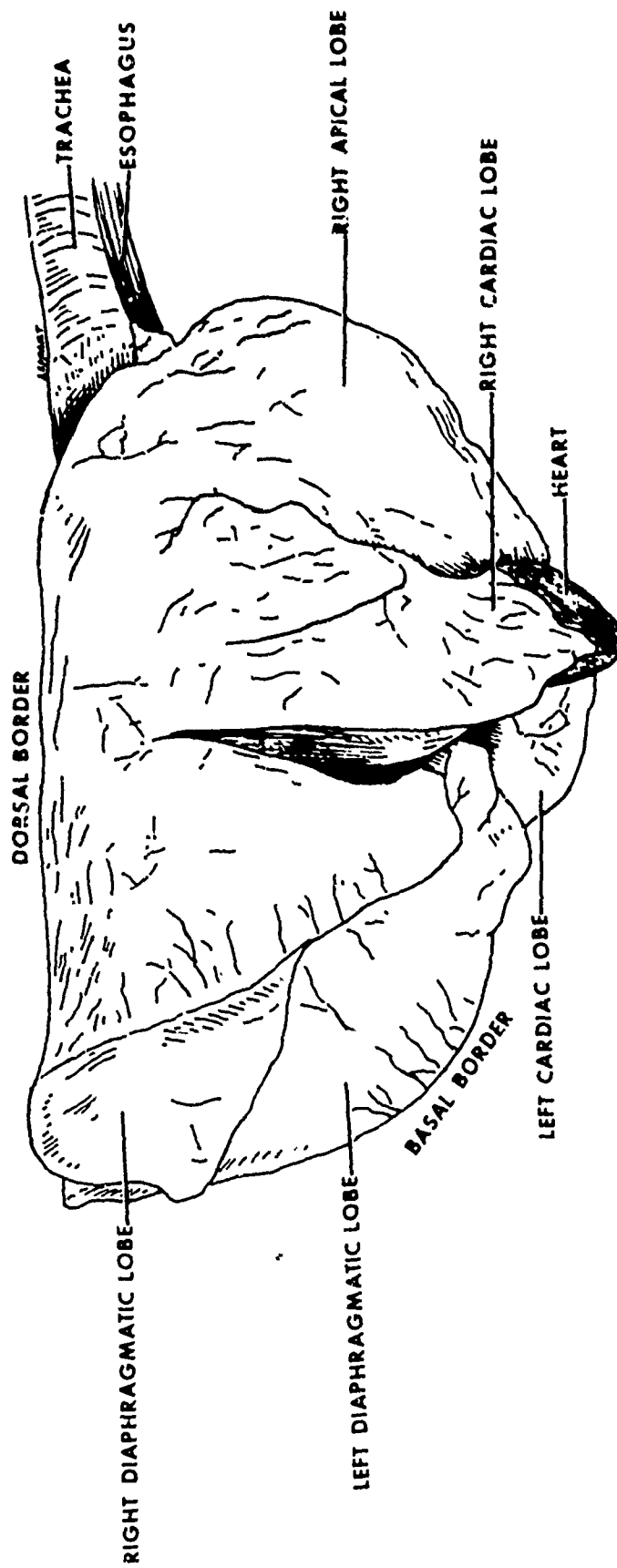


Figure 16. Costal Surface of Right Lung of Goat



Figure 17. Costal Surface of Right Lung of Goat

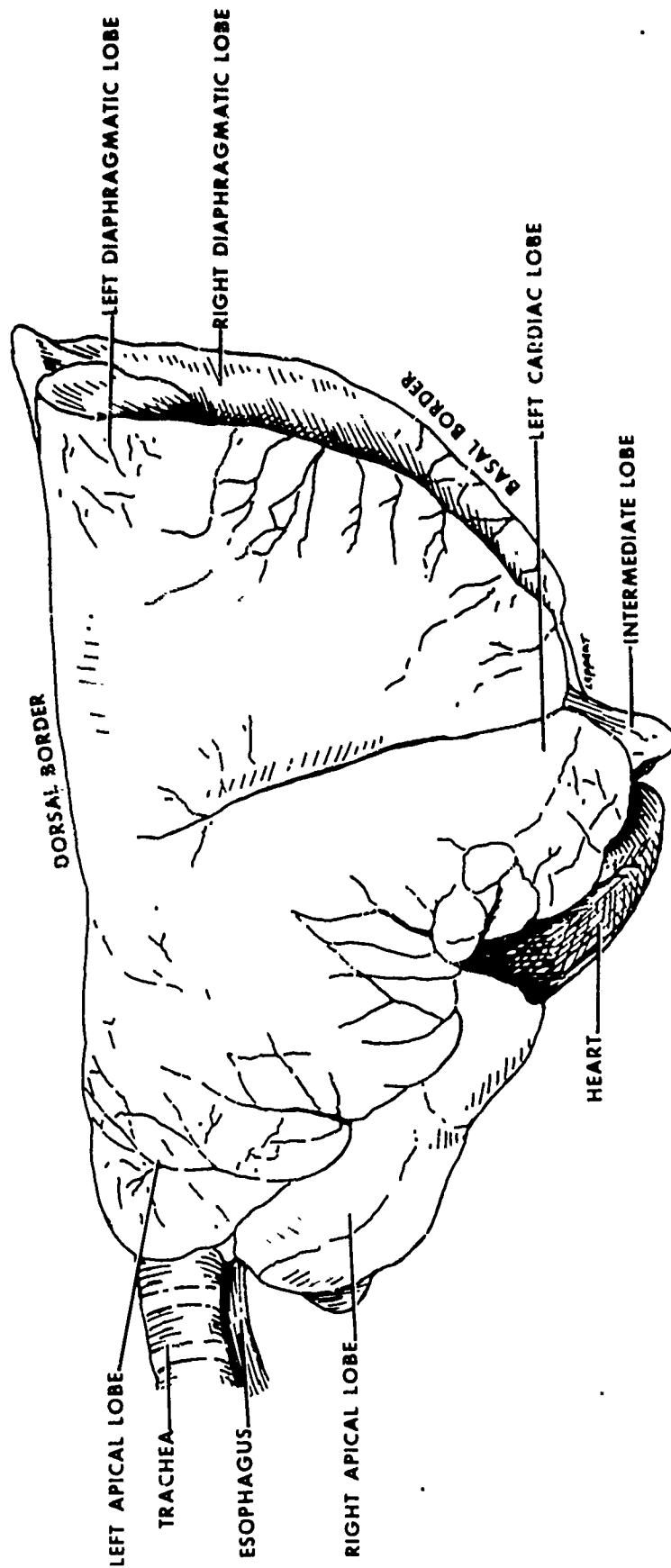


Figure 18. Costal Surface of Left Lung of Goat



Figure 19. Costal Surface of Left Lung of Goat



RIGHT



LEFT

Figure 20. Left and Right View of Goat Lung

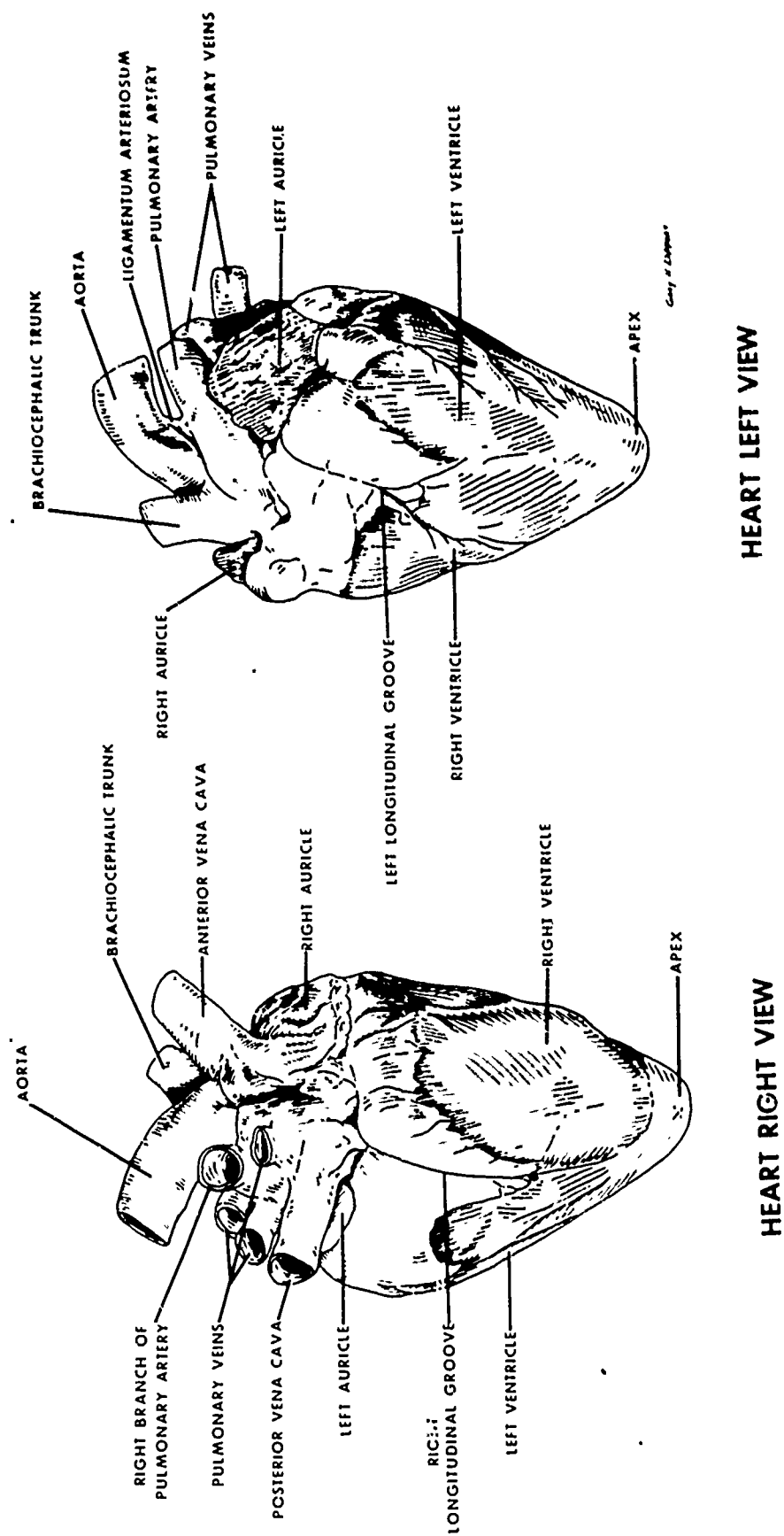


Figure 21. Right and Left View of Goat Heart



CONTINUED



RESEARCH

Figure 22. Right and Left View of Goat Heart

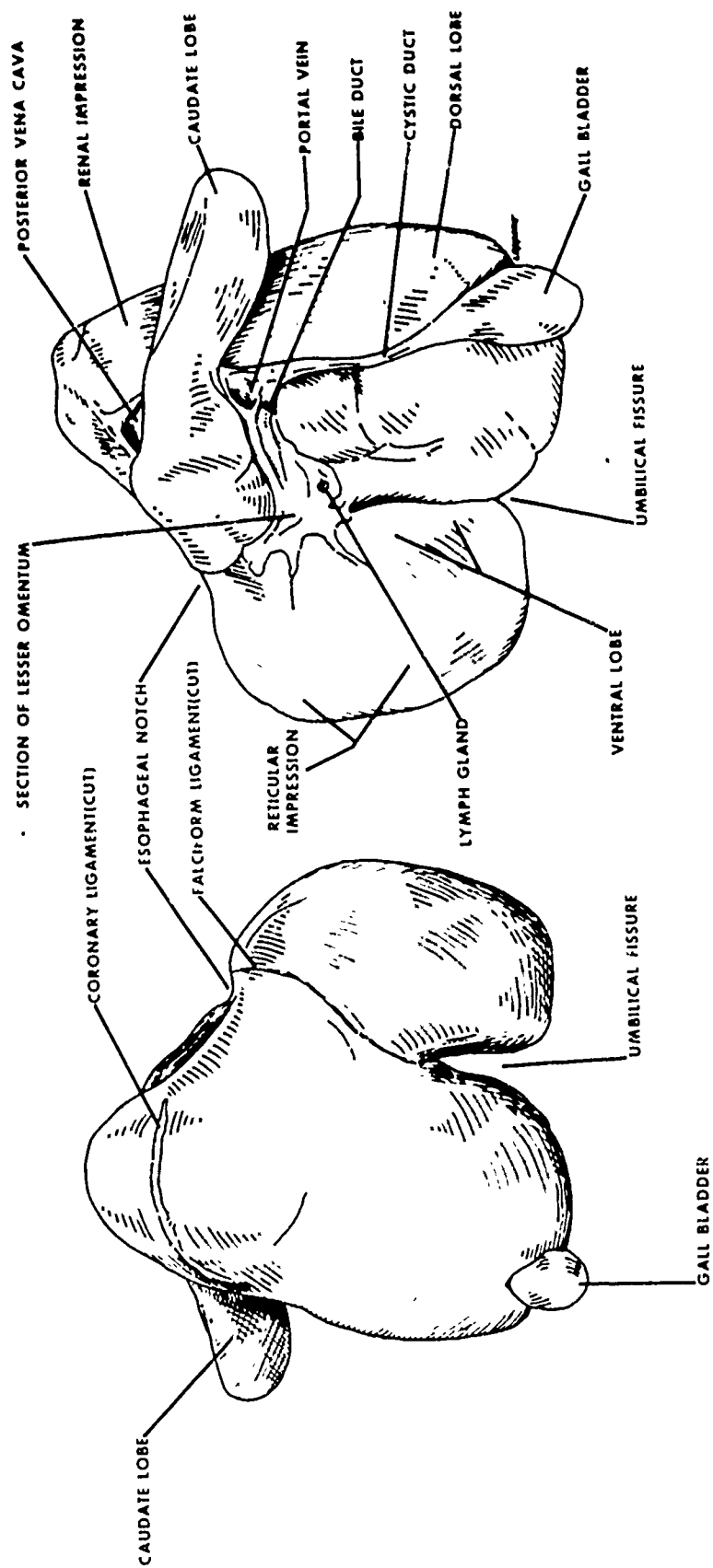


Figure 23. Parietal and Visceral View of Goat Liver

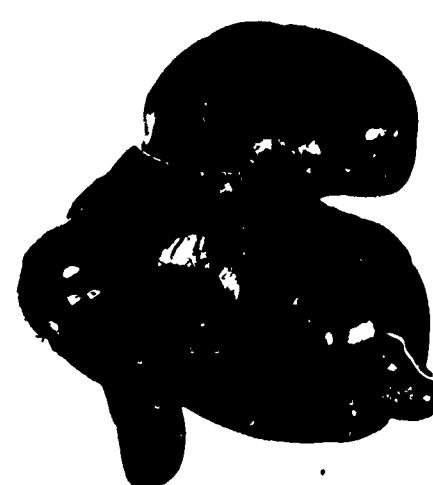


Figure 24. Parietal and Visceral View of Goat Liver

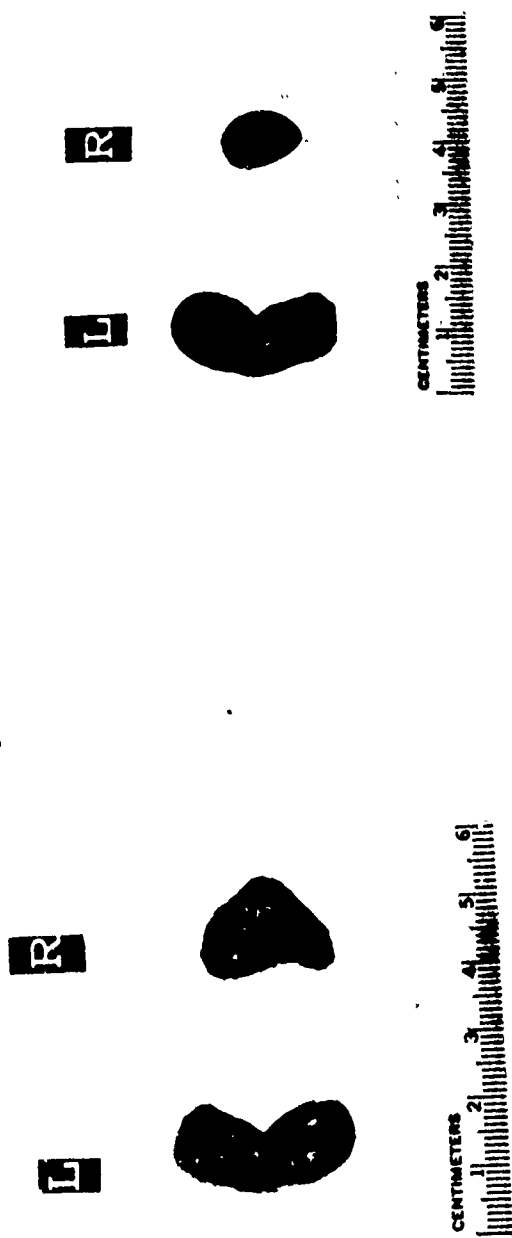


Figure 25. Left and Right View (Cut Surface) of Goat Adrenal

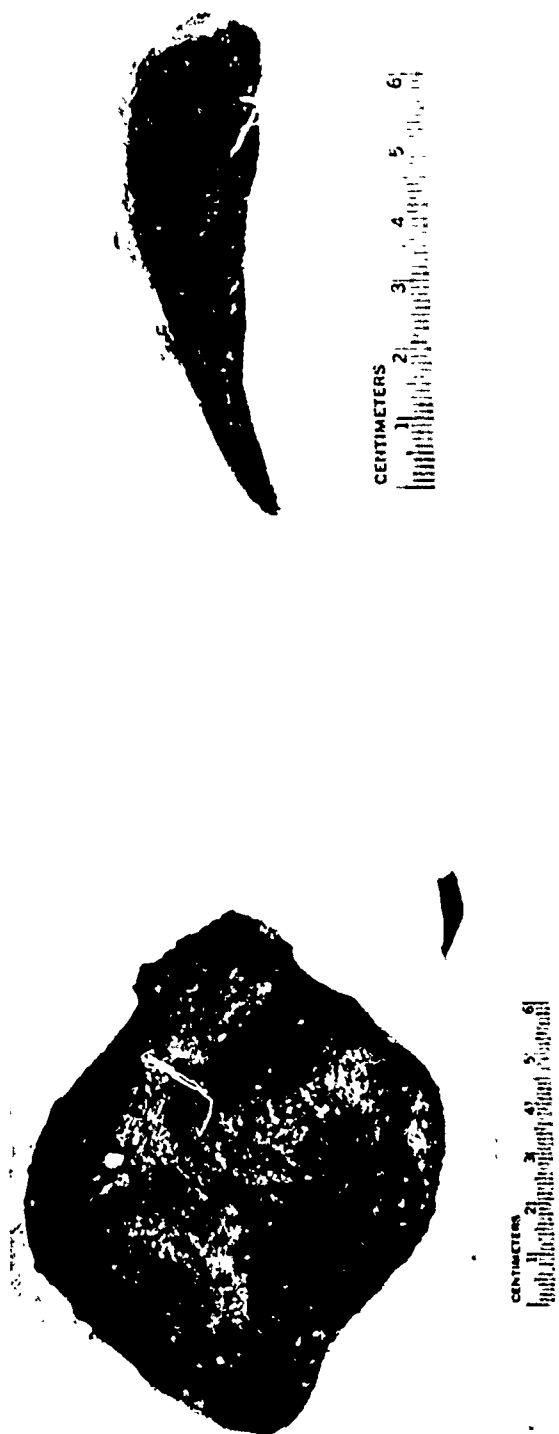


Figure 26. Lateral and Cut Surface of Goat Spleen



Figure 27. Visceral and Parietal View of Goat Pancreas

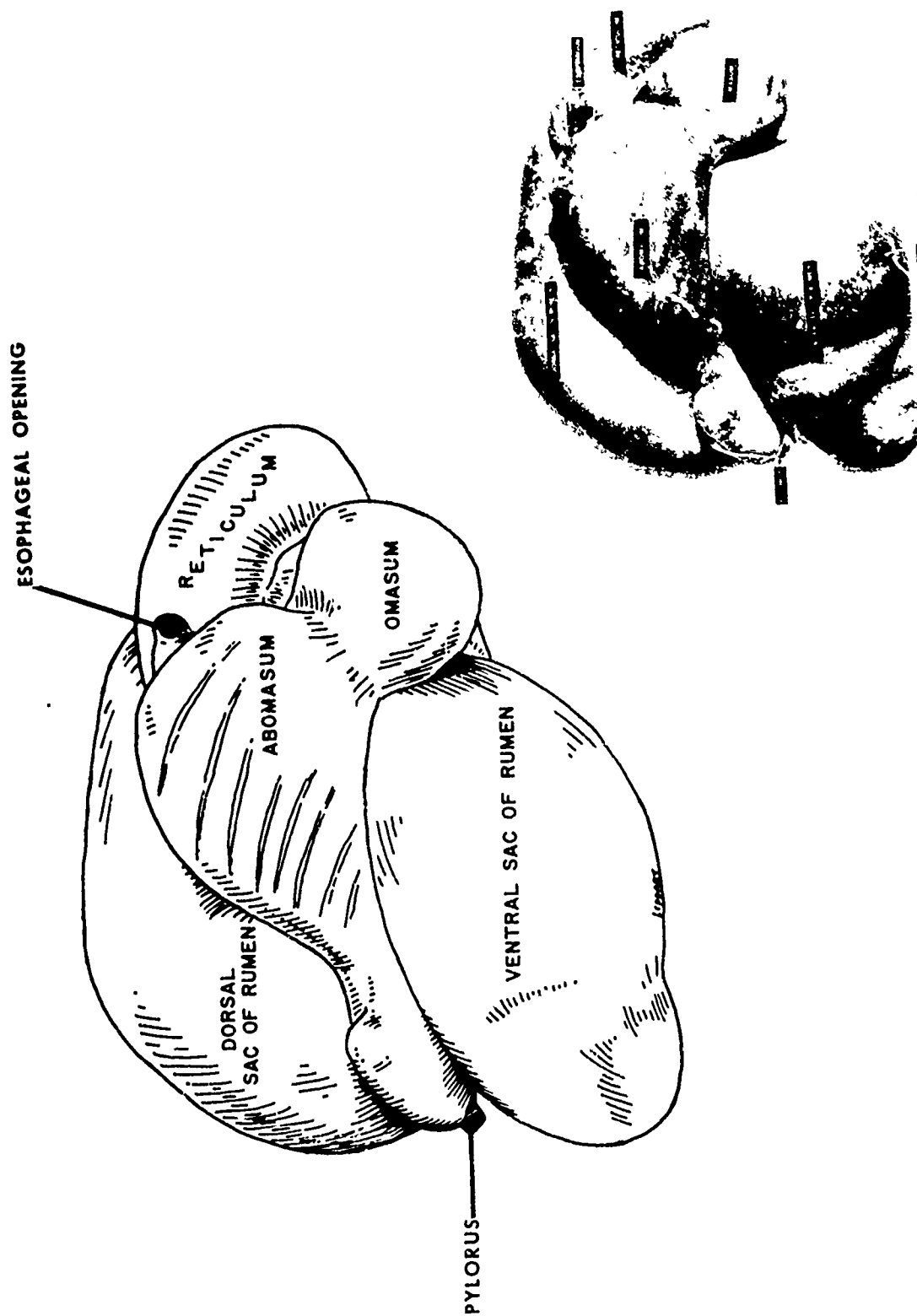


Figure 28. Right Lateral View of Goat Stomach

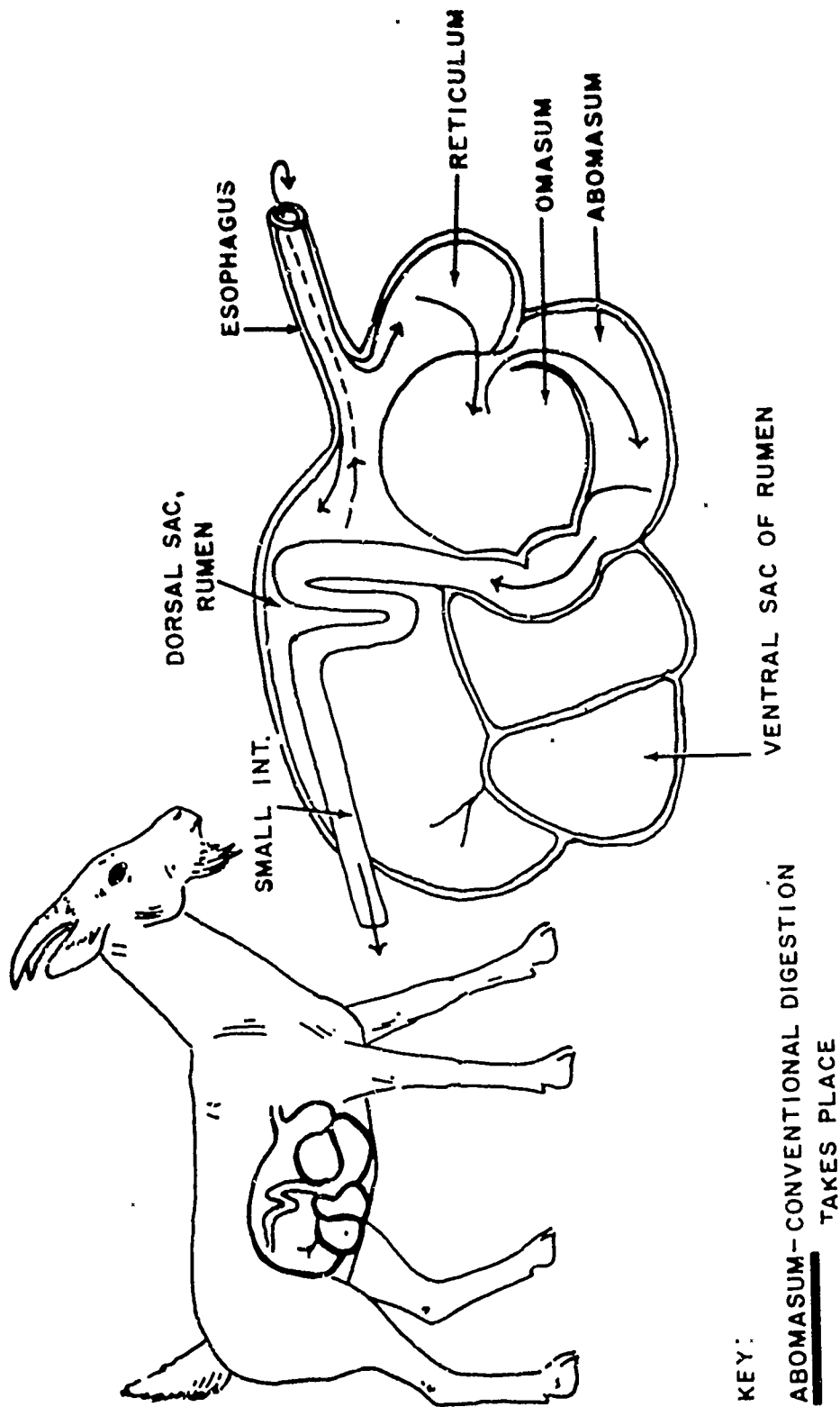


Figure 29. Digestive System in the Domestic Goat

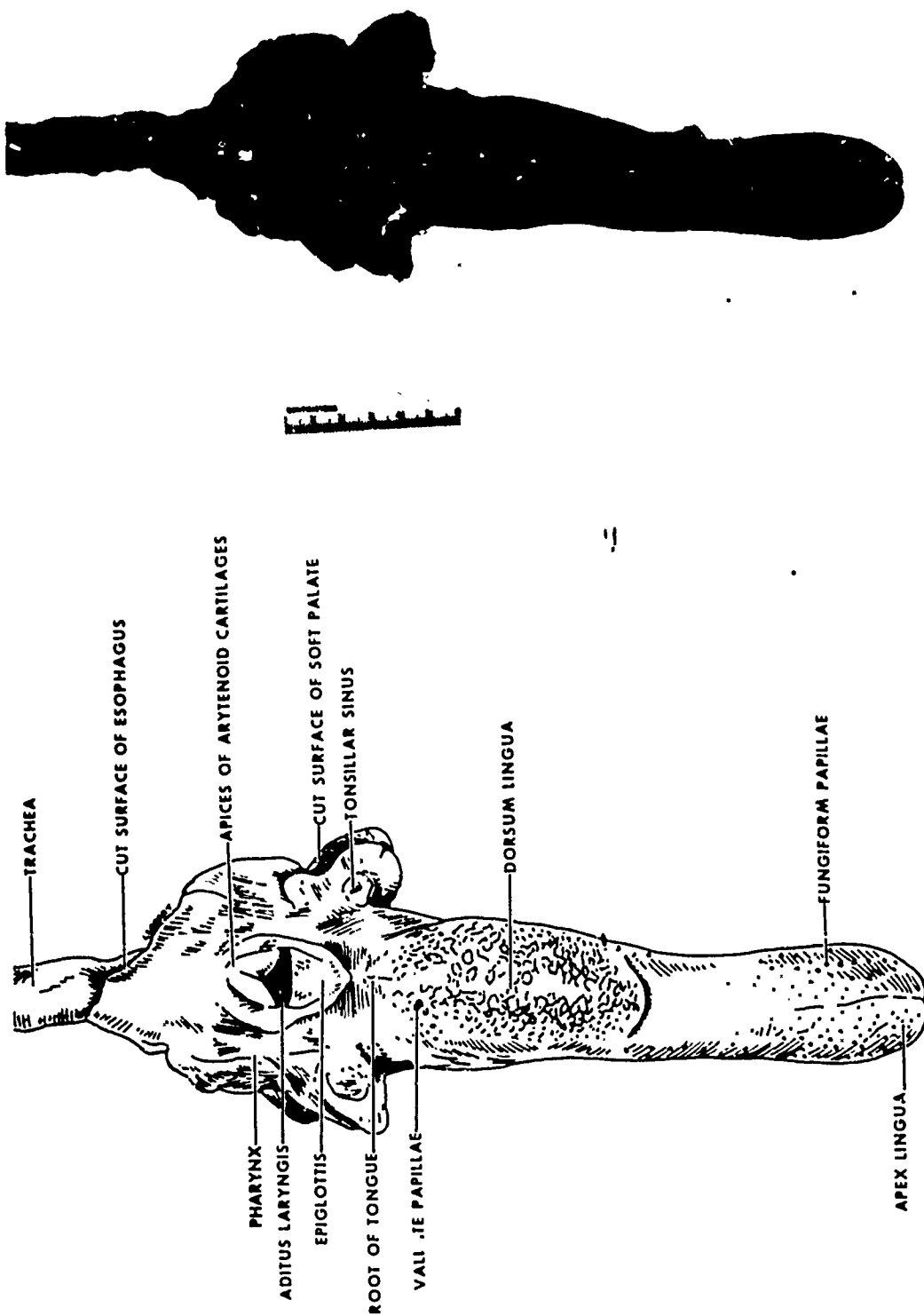
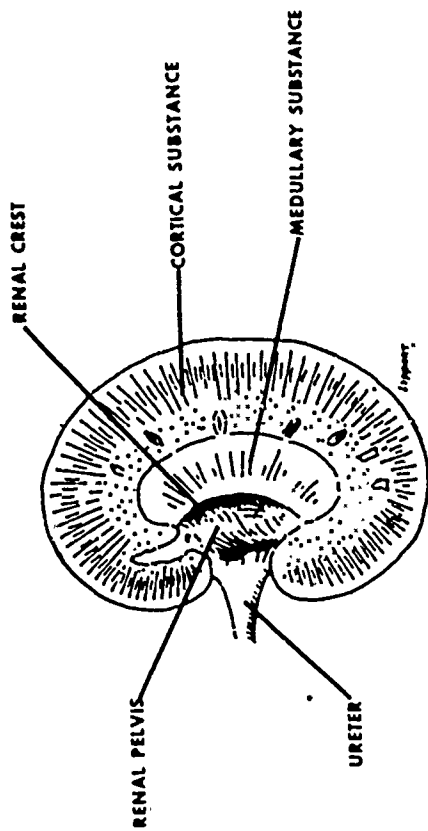
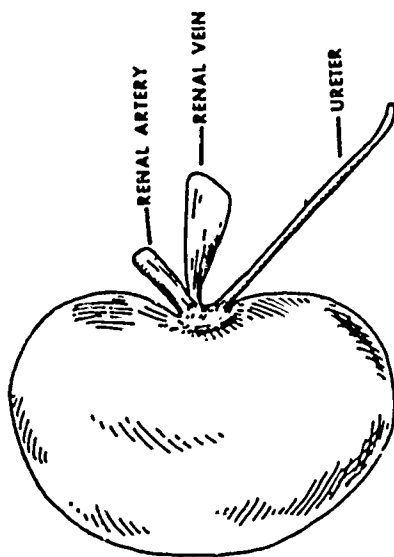


Figure 30. Dorsal View of Goat Tongue, Pharynx, Larynx, Etc.



CUT SECTION



VENTRAL VIEW

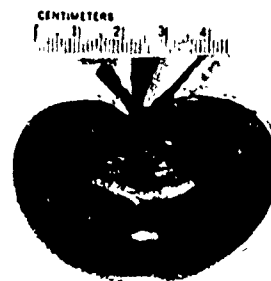


Figure 31. Right Kidney of Goat

LITERATURE CITED

1. Hopkins, C. E., Sr., Hamm, T. E., Jr., and Leppart, G. L. EATR 4431. Atlas of Goat Anatomy. Part I: Osteology. September 1970.
2. Hopkins, C. E., Sr., Hamm, T. E., Jr., and Leppart, G. L. EATR 4626. Atlas of Goat Anatomy. Part II: Serial Cross Section. April 1972.
3. Hopkins, C. E., Sr., Hamm, T. E., Jr., and Leppart, G. L. EATR 4706. Atlas of Goat Anatomy. Part III: Myology. April 1973.
4. Simon, S., and Grossman, J. D. Anatomy of Domestic Animals. 4th Edition. W. B. Saunders Company, Philadelphia, Pennsylvania. 1953.
5. May, N. Anatomy of Sheep. 2d Edition. University of Queensland Press, Wilke Company, Australia. 1964.
6. Miller, M. E., Christensen, G. C., and Evans, H. E. Anatomy of Dog. W. B. Saunders Company, Philadelphia, Pennsylvania. 1964.